



METHODS FOR TRACKING VOLUME/INTENSITY CHANGE

Final Report

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1.0 INTRODUCTION

The implementation of the new Medicare Fee Schedule (MFS) could have substantial impacts on volume and service intensity. The potential magnitude and direction of these effects are unknown; both increases and decreases in physician services are possible, and may be accompanied by changes in Part A services that are either substitutes or complements. It is thus imperative that HCFA be able to monitor short-run trends in volume and service intensity in order to respond quickly to any indications of overuse or underuse. HCFA also needs the capability to detect changes that affect only subparts of the Medicare population. Of particular concern would be more "vulnerable" enrollees, e.g., blacks, joint Medicaid eligibles, rural residents, etc.

This project was originally designed to develop an episode of care tracking system, a file that would examine the number and mix of services provided to patients with a specific illness. This system would enable analysts to monitor trends in volume and service intensity, while holding casemix constant. From 1985 to 1988, physician spending during AMI admissions increased more than 50 percent, compared with 29 percent for medical DRGs as a whole, for example (Mitchell, forthcoming). Since mean lengths of stay dropped by more than a day over this time period, how can we explain this dramatic increase? The episode of care tracking system would enable researchers to examine trends in the use of various diagnostic tests for AMI patients during the hospital stay, as well as postdischarge rehabilitation. It could also examine these trends along such dimensions as geographic location and beneficiary characteristics.

Chapter 2 outlines the data base and sample. A technical appendix discusses the problems encountered with the NCH data base and the ANCHR system in more detail. Chapter 3 presents results for the three episodes of care, and makes recommendations for future work.

2.0 METHODS

2.1 Data Sources

The Medicare National Claims History (NCH) data for 1991 constituted the primary data source for this project. We used the principal diagnosis on the Medicare Provider Analysis and Review (Medpar) record to identify episodes of care for our two medical conditions: acute myocardial infarction (AMI) and chronic obstructive pulmonary disease (COPD). While we could have identified our surgical procedure, coronary artery bypass graft (CABG) surgery from the Medpar record as well, we chose instead to identify our cases from Part B NCH records for two reasons. First, we felt that this was more appropriate for a system designed to monitor physician payment reform. Second, it provided an opportunity to test the use of NCH (as opposed to Medpar) as the vehicle for constructing the finder file. (A "finder file" is the file of all Health Insurance Claim (HIC) numbers that have been identified as having had the diagnosis or procedure of interest.)

All cases were identified from the random 5 percent sample maintained on-line at NCH. This sample is equivalent to that used earlier for the Part B Medicare Annual Data (BMAD) beneficiary sample, namely a random sample of beneficiaries and all of their claims. We further restricted the sample to those beneficiaries who were eligible for both Parts A and B and who were not enrolled in an HMO.

2.2 Sample Selection

The file construction and data analysis done for this report was one of the first and most extensive external use of National Claims History data. It was also one of the earliest efforts to access the NCH data with HCFA's on-line interactive software

(ANCHR) for research purposes. The on-line (ANCHR) component of the National Claims History File was used to identify all Medicare beneficiaries (from a 5 percent sample of beneficiaries) hospitalized in 1991 with a principal diagnosis of acute myocardial infarction (ICD-9 code 410) or chronic obstructive pulmonary disease (ICD-9 codes 491, 492, 493, or 496). The ANCHR system was also used to identify beneficiaries with physician claims for coronary artery bypass graft (CABG) procedures in 1991 (again, from a 5 percent sample of beneficiaries).

The health insurance claim numbers (HICNO) for beneficiaries in these three groups were then sent to HCFA so that full 1991 Medicare claims data could be obtained for the preliminary sample. The full claims detail was obtained from MANRLINE output from the near-line NCH database (which contains all Medicare claims for all beneficiaries for a four-year period). However, equivalent claims data from the 1991 MedPAR file were substituted for NCH acute hospital claims because of ease of use. (In the MedPAR file, a single hospital admission is represented by a single admission-through-discharge claim, whereas in NCH data, a single admission may be represented by several interim bills and a final bill.)

Data on HMO enrollment, state of residence, enrollment in Medicare and Medicaid, date of death, as well as patient demographics, were obtained from HCFA's 1991 Denominator File, and then merged onto the index admission. This preliminary sample of beneficiaries was cleaned by dropping those who had been enrolled in an HMO during any part of 1991 (since physician claims would not reliably be present), beneficiaries who resided outside one of the 50 states or the District of Columbia, and beneficiaries who were not enrolled in both Part A and Part B during the month of their index admission.

All files were extensively cleaned by programmers at CHER to eliminate duplicate and denied claims. Then, for each beneficiary, an "index" admission was identified. For medical conditions (AMI and COPD), this admission was defined as the

first acute hospital admission in 1991 with the designated principal diagnosis. For the surgical condition (CABG), surgical claims for CABG procedures were matched by date and HICNO against MedPAR claims to identify the inpatient stay during which the procedure was performed. This stay became the index admission for CABG procedures. AMI patients who also received CABG surgery were included in both episodes.

For each index admission, a time window was constructed, using the index admission date as a reference point. The pre-admission period was defined as the seven-day period before the admission date. The post-discharge period was defined as 30 days following the date of discharge from the index hospitalization. Beneficiaries admitted in early January 1991 (whose pre-admission period would have begun in 1990) or discharged in December 1991 (whose post-discharge period would have extended into 1992) were dropped from the analysis.

Using these time windows, we then constructed an episode of care for each beneficiary, including:

- the index admission;
- dates and diagnoses of pre- and post-index hospital transfers (transfers were defined as discharge from one hospital that occurred on the same day as an admission to a second hospital), and of readmissions within the episode;
- beneficiary characteristics from the 1991 Denominator File (age, sex, race, place of residence, reasons for Medicare eligibility, and Medicaid coverage);
- claims for physician services provided in any location during the pre-admission period, index admission, and post-discharge period.

These beneficiary-level episode of care records were then used as an analytic file to examine the demographic characteristics of patients admitted in the three

medical/ surgical categories, and to describe patterns of care during the episode. The episode was divided into three periods, pre-admission, initial hospitalization, and discharge through 30 days. While the index admission is defined as the first acute care admission with an appropriate diagnosis or procedure, it quickly became clear that transfers to other acute care facilities were an important component of the initial hospitalization, particularly for individuals with the diagnosis of AMI. For example, preliminary analysis indicated that only 47 percent of physician supplier expenses occurred during the index admission, with 18 percent occurring pre-admission and 34 percent occurring post-discharge. This seemed like a gross underestimate of the importance of the initial hospitalization. Therefore, the initial hospitalization was redefined to include the index admission plus transfers to other acute care hospitals.*

*Unfortunately, we had already identified physician supplier claims as pre-admission, inpatient, and post-discharge, based on discharge dates from the index admission, rather than from the transfer. We therefore tried to identify physician supplier services occurring during transfers by including as part of the initial hospitalization all services whose place of service is an inpatient hospital. These are the numbers presented in this report. These numbers overstate slightly the proportion of services received during the initial hospitalization, since they include any inpatient services received prior to the admission or during subsequent readmissions.

3.0 RESULTS

3.1 Introduction

The principal purpose of this project was to test the feasibility of constructing episodes of care (including both Part A inpatient and Part B claims) from NCH data. As described in the technical appendix there were multiple problems in accessing, obtaining, and editing NCH data. However, once those software and data-related problems were resolved, episodes of care could be constructed as easily as they were in prior analyses using BMAD data. The purpose of this chapter is to demonstrate what the episodes looked like, and to provide examples of the kinds of analyses that could be conducted for purposes of tracking utilization.

In order to test a range of episode types, we selected two episodes based on principal diagnosis and one based on surgical procedure. These were: acute myocardial infarction (AMI), an acute condition; coronary artery bypass graft (CABG) surgery, and chronic obstructive pulmonary disease (COPD), a chronic condition.

Table 3-1 displays the sample sizes and selected patient characteristics for each of the three episodes. COPD patients were more likely to be black, female, and Medicaid-eligible. AMI patients were more likely to be older, especially aged 85 and over. Note the relatively small number of CABG patients who are black, female, or Medicaid-eligible.

Table 3-2 summarizes characteristics of the episodes themselves. These characteristics are based on data drawn from both the Part A and Part B claims. All of these data are consistent with what we would expect with these types of episodes. Lengths of stay are longest for the surgical episodes, but mortality rates are highest for the AMIs. (Some number of AMI patients go on to receive CABG surgery; we examine this later.) The high transfer rates for AMI and CABG patients, while not surprising, are a good reminder of the importance of retaining this information when constructing episodes of care.

As expected, facility (inpatient hospital) expenditures represent the lion's share of total Medicare reimbursement, with CABG episodes being far more expensive than AMI or COPD episodes. Physician reimbursement is positively correlated with facility reimbursement.

The overwhelming majority of physician expenditures take place during the inpatient stay itself. The higher the total physician bill, the larger the proportion of the bill that was incurred in the hospital setting. This simply reflects the fact that expensive surgeries (like CABG) and expensive diagnostic tests (like cardiac catheterization for AMI patients) are performed in the inpatient setting. Interestingly, while the post period is four times as long as the pre period (30 vs. 7 days), the out-of-hospital spending is roughly equal during the two time periods. It should be noted, however, that these patterns are based on pre-MFS data. As part of the Medicare Fee Schedule, uniform payment policies were developed for global surgical periods and all carrier procedures were standardized.

Finally, the percent of allowed charges paid to participating physicians and the percent accepted on assignment are also shown in Table 3-2.

In the next three sections, we display detailed utilization tables for each of the three episode types. All tables are similar, showing the following information:

- mean expenditure per enrollee (average allowed);
- mean number of services (average number of services per patient);
- percent receiving service (percent of patients receiving at least one service); and
- mean number of services per recipient (average number of services per user).

3.2 Episodes of Care for Acute Myocardial Infarction (AMI)

AMI patients average \$184 in Part B allowed charges in the seven days prior to admission (Table 3-3). Over one-half of this amount is accounted for by visits to the emergency room and the transport there by ambulance.

Once admitted to the hospital (Table 3-4), the majority of patients received routine hospital visits, averaging almost 12 visits during the stay (despite a mean length of stay of only nine days). Routine hospital visits are generally billed only by attending physicians; however, in the case of very sick patients, concurrent hospital visits may be provided by other physicians. Almost two-thirds of AMI patients also receive critical care visits and over one-half received at least one consultation. Over \$700 in inpatient physician bills was spent on the average AMI patient just for these visits and consultations. Four out of every 10 AMI patients underwent cardiac catheterization and/or angiography. While only about 10 percent of patients received bypass surgery or PTCA, these procedures were so costly that they raised the average inpatient bill substantially. Not surprisingly, almost every patient received at least one ECG (averaging over 6 tests per recipient), and one-half also underwent echocardiography.

Relatively little was spent during the 30 days following discharge from the hospital (Table 3-5). Ambulance transport home (or to another facility) and a follow-up office visit were the two largest expenses. It is noteworthy, however, that almost 12 percent of discharged AMI patients returned to the ER at least once during this time period.

3.3 Episodes of Care for CABG Patients

During the week immediately preceding admission for bypass surgery, only one-third of patients made an office visit (Table 3-6). Since this is generally a discretionary procedure, most patients had probably met with the thoracic surgeon several weeks earlier. The surgeon's fee itself accounts for about 40 percent of the total inpatient physician bill (Table 3-7). The services of an assistant surgeon and an anesthesiologist during the surgery accounted for another 15 percent. The majority of patients (89%) received cardiac catheterization and/or angiography prior to surgery. Since this is a prerequisite to CABG surgery, the remaining 11 percent presumably underwent this procedure during an earlier hospital stay.

Despite the fact that the surgeon's bill includes pre and postoperative care, almost every patient received routine hospital visits from other physicians (averaging about one a day) and most patients also received critical care visits. Bills for evaluation and management services totaled over \$1,200.

The majority of patients (70.5%) made at least one office visit that was billed during the 30 days following discharge (Table 3-8). Since the surgeon's global fee covers the 90-day postoperative period, these visits presumably took place with the patient's family internist or cardiologist. The bulk of the remaining post-discharge physician dollars were spent on follow-up EKGs, lab tests, and x-rays.

3.4 Episodes of Care for COPD Patients

Almost one-half of COPD patients visit the ER during the seven days immediately preceding admission (Table 3-9); presumably, in most cases, the decision to admit was made during this visit. Part B bills for office visits, oxygen concentrators, and ambulance services accounted for most of the remaining pre-admission spending.

Almost one-half of the inpatient spending is accounted for by routine hospital visits (\$353 of \$760). See Table 3-10. Other evaluation and management services accounted for an additional 15 percent. The majority of patients also received EKGs and radiology services. Surprisingly, pulmonary equipment and tests accounted for only a small part of the total inpatient bill (\$45, or 6%). This is likely due to the fact that any equipment used on an inpatient basis is included in the facility bill. Similarly, Part B bills for inpatient test are for the professional component only.

Pulmonary equipment and tests accounted for a larger proportion of the Part B bill during the first month post-discharge, however: \$79 or one-third (Table 3-11). Almost two-thirds of COPD patients made an office visit during this month and one-sixth returned to the ER.

3.5 Using Claims Data to Study Outcomes

In tracking utilization over time, policymakers are particularly interested in how changes in service use may be systematically related to patient characteristics, such as race and gender (that is, characteristics unrelated to the need for a given service). A key methodological issue is how to control for differences in illness or casemix. Table 3-12 presents an example of how this could be done using claims data.

Race and gender differences in access to cardiac surgery have been documented in a number of studies. Table 3-12 examines this by focusing on patients admitted with AMI, that is, patients with a given minimum level of health problems. Marked differences in utilization of CABG surgery, PTCA, and cardiac catheterization can be observed by gender, race, and dual eligibility for Medicaid. (All data have been age-adjusted.) Males and whites are about twice as likely to undergo CABG surgery and PTCA as are females and black beneficiaries, respectively. Medicare enrollees not jointly eligible for Medicaid are about 50 percent more likely to undergo these procedures, compared with those who are Medicaid-eligible. Utilization differences for cardiac catheterization are similar but not as pronounced. (Cardiac catheterization is a necessary condition for proceeding to surgery.) There were no differences by urban-rural location of the beneficiary's residence.

TABLE 3-1

CHARACTERISTICS OF PATIENTS

	Acute Myocardial Infarction (AMI)	Coronary Artery Bypass Graft (CABG)	Chronic Obstructive Pulmonary Disease (COPD)
<u>Number of Patients</u>	12,023	6,662	8,352
<u>Race</u>			
White	90.2 %	90.8 %	86.7 %
Black	6.0	4.4	9.2
Other	1.6	2.5	2.2
Unknown	2.2	2.3	1.9
<u>Sex</u>			
Male	53.6	66.3	44.4
Female	46.4	33.7	55.6
<u>Age</u>			
Less Than 65	8.0	15.4	15.2
65-69	20.8	30.8	22.5
70-74	22.2	29.1	23.1
75-79	20.8	17.3	19.2
80-84	15.5	6.5	12.0
85 and Over	12.7	0.8	7.9
<u>Medicaid Eligibility</u>			
No	87.8	91.8	78.7
Yes	12.2	8.2	21.3
<u>Location</u>			
Urban	69.0	72.5	71.3
Rural	31.0	27.5	28.7

SOURCE: CHER analysis file of 1991 Medicare NCH physician supplier claims and MedPAR hospital/SNF claims for a 5 percent sample of beneficiaries

TABLE 3-2

CHARACTERISTICS OF MEDICARE PART A AND B EPISODES OF CARE FOR SELECTED DIAGNOSES

	Acute Myocardial Infarction (AMI)	Coronary Artery Bypass Graft (CABG)	Chronic Obstructive Pulmonary Disease (COPD)
Average Length of Stay (Days)(1)	8.9	16.2	9.0
Mortality Rate (Within 30 Days Post-Admission)	20.4 %	6.3 %	6.0 %
Transfer Rate			
Transferred From Other Acute Care Hospital	7.0 %	23.0 %	5.7 %
Transferred To Other Acute Care Hospital	15.8	10.1	2.4
Average Medicare Reimbursement Per Episode			
Total	\$9,456	\$31,948	\$6,016
Facility Reimbursement during Initial Hospitalization (1)	6,742	23,444	4,869
Physician/Supplier Reimbursement	2,714	8,504	1,147
Percent of Physician/Supplier Reimbursement Pre, During, and Post Hospitalization			
Seven Days Pre-Admission	6.8 %	3.0 %	13.0 %
During Hospitalization(2)	87.0	94.3	66.2
Post Discharge to 30 Days After Discharge	6.2	2.7	20.7
Percent Paid to Participating Physicians	68.6 %	70.4 %	61.3 %
Percent Accepted on Assignment	86.0 %	83.9 %	90.7 %

(1)Index admission plus transfers to other acute care hospitals.

(2)Includes all services during Index admissions or with place of service identified as an inpatient hospital.

SOURCE: CHER analysis of 1991 NCH physician/supplier claims and MedPAR hospital/SNF claims, for a 5 percent sample of beneficiaries.

TABLE 3-3

PART B EXPENDITURE AND SERVICE UTILIZATION PRE-ADMISSION:
ACUTE MYOCARDIAL INFARCTION

<u>TYPE OF SERVICE</u>	<u>Mean Expenditure Per Enrollee</u>	<u>Mean Number of Services</u>	<u>Percent Receiving Service</u>	<u>Mean Number of Services Per Recipient</u>
<u>Visits</u>				
Office	\$8.70	0.3	24.3 %	1.2
Emergency Room	44.55	0.6	57.6	1.1
Consultations	1.48	0.0	1.6	1.1
Other	0.73	0.0	2.0	1.1
<u>Cardiac Tests/ Procedures</u>				
Cardiac Catheterization and/or Angiography	1.37	0.0	0.2	1.2
EKG	6.91	0.4	28.2	1.4
Rhythm EKG	0.73	0.1	7.3	1.1
24 Hour ECG Monitoring	0.37	0.0	0.2	1.3
Stress Tests	0.55	0.0	0.6	1.1
Echocardiogram	2.38	0.0	1.2	1.7
RMP	0.47	0.0	0.2	1.1
Cardiac Blood Pool	0.12	0.0	0.0	2.0
<u>Other</u>				
Radiology	7.68	0.4	31.3	1.3
Transport/Ambulance	67.55	NA	11.9	NA
Laboratory	4.45	NA	30.7	NA
All Other Services	35.50	NA	29.9	NA
<u>Total</u>	\$184.18			

NOTE: Seven days prior to admission.

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-4

PART B EXPENDITURE AND SERVICE UTILIZATION DURING HOSPITALIZATION; ACUTE MYOCARDIAL INFARCTION

<u>TYPE OF SERVICE</u>	<u>Mean Expenditure Per Enrollee</u>	<u>Mean Number of Services</u>	<u>Percent Receiving Service</u>	<u>Mean Number of Services Per Recipient</u>
<u>Visits</u>				
Hospital	\$393.33	10.6	89.6 %	11.8
Critical Care	238.46	4.1	61.0	6.8
Emergency Room	4.01	0.1	5.2	1.2
Consultations	106.49	1.1	57.7	2.0
Other	0.87	0.0	1.5	1.4
<u>Cardiac Procedures</u>				
CABG	363.83	0.1	11.1	1.1
Valve Replacement	16.19	0.0	0.7	1.1
Insertion of Temporary Pacemaker	13.36	0.1	4.7	1.1
Insertion of Permanent Pacemaker	11.96	0.0	1.3	1.1
Percutaneous Insertion of Intra-Aortic Balloon Catheter	22.49	0.0	3.0	1.2
PTCA	198.51	0.2	11.9	1.3
Cardiac Catheterization and/or Angiography	342.86	0.7	41.3	1.6
<u>Cardiac Tests</u>				
EKG	62.02	5.3	85.2	6.3
Rhythm EKG	1.53	0.2	5.0	3.4
24 Hour ECG Monitoring	4.74	0.1	5.8	1.2
Stress Tests	7.94	0.1	11.8	1.1
Echocardiogram	81.99	1.0	49.3	2.0
RMP	8.02	0.1	7.7	1.1
Cardiac Blood Pool	5.90	0.1	7.6	1.2
<u>Other</u>				
Radiology	81.58	4.3	84.8	5.1
Transport/Ambulance	38.82	NA	14.5	NA
Laboratory	13.23	NA	17.1	NA
Anesthesiology	109.11	NA	16.4	NA
Assistant at Surgery	44.71	NA	8.3	NA
All Other Services	190.73	NA	41.8	NA
<u>Total</u>	\$2,362.67			

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-5

PART B EXPENDITURE AND SERVICE UTILIZATION POST-DISCHARGE;
ACUTE MYOCARDIAL INFARCTION

	Mean Expenditure Per Enrollee	Mean Number of Services	Percent Receiving Service	Mean Number of Services Per Recipient
<u>TYPE OF SERVICE</u>				
<u>Visits</u>				
Office	\$28.22	1.0	55.9 %	1.7
Emergency Room	8.65	0.1	11.7	1.2
Consultations	2.62	0.0	2.9	1.1
Other	3.15	0.1	5.4	1.7
<u>Cardiac Tests/ Procedures</u>				
Cardiac Catheterization and/or Angiography	8.09	0.0	1.1	1.4
EKG	8.09	0.3	25.6	1.3
Rhythm EKG	0.24	0.0	1.9	1.4
24 Hour ECG Monitoring	4.62	0.0	2.4	1.3
Stress Tests	5.57	0.1	5.5	1.1
Echocardiogram	6.54	0.0	2.5	1.8
RMP	5.98	0.0	2.8	1.1
Cardiac Blood Pool	0.74	0.0	0.4	1.2
<u>Other</u>				
Radiology	8.77	0.3	17.1	1.6
Transport/Ambulance	21.11	NA	NA	NA
Laboratory	13.16	NA	NA	NA
All Other Services	41.74	NA	35.5	NA
<u>Total</u>	\$167.30			

NOTE: 30 days after discharge.

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-6

PART B EXPENDITURE AND SERVICE UTILIZATION PRE-ADMISSION;
CORONARY ARTERY BYPASS SURGERY

	Mean Expenditure Per Enrollee	Mean Number of Services	Percent Receiving Service	Mean Number of Services Per Recipient
<u>TYPE OF SERVICE</u>				
<u>Visits</u>	\$13.76	0.4	31.7 %	1.2
Office	0.38	0.0	0.4	1.5
Emergency Room	6.26	0.1	6.4	1.1
Consultations	0.08	0.0	0.3	1.2
Other				
<u>Cardiac Tests/Procedures</u>				
Cardiac Catheterization and/or Angiography	53.65	0.1	6.3	1.3
EKG	8.11	0.4	31.5	1.3
Rhythm EKG	0.37	0.0	3.7	1.0
24 Hour ECG Monitoring	0.67	0.0	0.5	1.1
Stress Tests	5.73	0.1	5.7	1.0
Echocardiogram	9.69	0.1	3.8	1.9
RMP	4.96	0.0	2.1	1.1
Cardiac Blood Pool	0.81	0.0	0.4	1.2
<u>Other</u>				
Radiology	12.16	0.4	28.5	1.3
Transport/Ambulance	78.37	NA	25.4	NA
Laboratory	7.39	NA	15.3	NA
All Other Services	54.96	NA	26.8	NA
<u>Total</u>	\$257.35			

NOTE: Seven days prior to admission

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-7

PART B EXPENDITURE AND SERVICE UTILIZATION DURING HOSPITALIZATION; CORONARY ARTERY BYPASS SURGERY

<u>TYPE OF SERVICE</u>	<u>Mean Expenditure Per Enrollee</u>	<u>Mean Number of Services</u>	<u>Percent Receiving Service</u>	<u>Mean Number of Services Per Recipient</u>
<u>Visits</u>				
Hospital	\$621.04	16.9	93.9 %	18.0
Critical Care	390.27	6.8	70.6	9.6
Emergency Room	2.21	0.0	3.0	1.1
Consultations	190.06	2.1	77.9	2.7
Other	0.55	0.0	0.9	1.2
<u>Cardiac Procedures</u>				
CABG	3,257.32	1.1	99.9	1.1
Valve Replacement	221.97	0.1	9.6	1.1
Insertion of Temporary Pacemaker	11.23	0.0	4.5	1.1
Insertion of Permanent Pacemaker	15.48	0.0	1.8	1.0
Percutaneous Insertion of Intra-Aortic Balloon Catheter	64.34	0.1	8.7	1.2
PTCA	71.82	0.1	4.1	1.7
Cardiac Catheterization and/or Angiography	742.58	1.7	88.7	1.9
<u>Cardiac Tests</u>				
EKG	84.13	7.1	93.9	7.5
Rhythm EKG	2.74	0.3	5.7	5.6
24 Hour ECG Monitoring	4.53	0.1	5.8	1.2
Stress Tests	4.68	0.1	6.9	1.1
Echocardiogram	84.07	0.9	41.1	2.3
RMP	6.27	0.1	5.3	1.2
Cardiac Blood Pool	6.63	0.1	8.3	1.2
<u>Other</u>				
Radiology	196.83	10.7	98.5	10.8
Transport/Ambulance	16.90	NA	6.5	NA
Laboratory	29.31	NA	37.0	NA
Anesthesiology	845.17	NA	97.6	NA
Assistant at Surgery	384.97	NA	67.1	NA
All Other Services	764.72	NA	83.9	NA
<u>Total</u>	\$8,019.83			

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-8

PART B EXPENDITURE AND SERVICE UTILIZATION POST-DISCHARGE;
CORONARY ARTERY BYPASS SURGERY

	Mean Expenditure Per Enrollee	Mean Number of Services	Percent Receiving Service	Mean Number of Services Per Recipient
<u>TYPE OF SERVICE</u>				
<u>Visits</u>				
Office	\$39.80	1.3	70.5 %	1.9
Emergency Room	9.26	0.2	12.7	1.3
Consultations	2.45	0.0	2.9	1.1
Other	1.79	0.1	2.5	2.0
<u>Cardiac Tests/Procedures</u>				
Cardiac Catheterization and/or Angiography	0.68	0.0	0.2	1.1
EKG	12.90	0.5	40.8	1.3
Rhythm EKG	0.27	0.0	2.1	1.2
24 Hour ECG Monitoring	5.31	0.0	2.9	1.3
Stress Tests	4.61	0.0	4.4	1.1
Echocardiogram	11.09	0.1	4.2	1.9
RMP	1.93	0.0	0.6	1.3
Cardiac Blood Pool	1.13	0.0	0.5	1.2
<u>Other</u>				
Radiology	16.38	0.6	38.2	1.6
Transport/Ambulance	23.09	NA	5.1	NA
Laboratory	25.84	NA	41.1	NA
All Other Services	70.23	NA	47.8	NA
<u>Total</u>	\$226.75			

NOTE: 30 days after discharge

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-9

PART B EXPENDITURE AND SERVICE UTILIZATION PRE-ADMISSION;
CHRONIC OBSTRUCTIVE PULMONARY DISEASE

<u>TYPE OF SERVICE</u>	<u>Mean Expenditure Per Enrollee</u>	<u>Mean Number of Services</u>	<u>Percent Receiving Service</u>	<u>Mean Number of Services Per Recipient</u>
<u>Visits</u>				
Office	\$12.22	0.4	33.1 %	1.3
Emergency Room	35.04	0.5	46.8	1.1
Consultations	1.00	0.0	1.1	1.1
Other	0.87	0.0	2.1	1.1
<u>Cardiac Tests</u>				
EKG	3.13	0.2	16.2	1.2
Rhythm EKG	0.40	0.0	4.1	1.0
<u>Pulmonary Equipment and Tests</u>				
Oxygen and Related Respiratory Equip, IPPB Machines, Humidifiers	4.97	0.0	3.7	3.7
Nebulizers	1.91	0.0	3.9	1.0
Oxygen Concentrators	11.26	0.0	4.1	1.1
Analysis of Arterial Blood Gas	0.70	0.0	2.4	1.0
Other Pulmonary Function Tests	2.03	0.1	5.6	1.6
<u>Other</u>				
Radiology	9.51	0.5	34.6	1.3
Transport/Ambulance	40.51	NA	19.4	NA
Laboratory	4.60	NA	12.1	NA
All Other Services	21.46	NA	27.6	11.6
<u>Total</u>	\$149.61			

NOTE: Seven days prior to index admission

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-10

PART B EXPENDITURE AND SERVICE UTILIZATION DURING HOSPITALIZATION;
CHRONIC OBSTRUCTIVE PULMONARY DISEASE

<u>TYPE OF SERVICE</u>	<u>Mean Expenditure Per Enrollee</u>	<u>Mean Number of Services</u>	<u>Percent Receiving Service</u>	<u>Mean Number of Services Per Recipient</u>
<u>Visits</u>				
Hospital	\$352.61	9.5	87.0 %	10.9
Critical Care	51.62	0.9	13.9	6.2
Emergency Room	2.85	0.0	4.1	1.1
Consultations	63.34	0.7	36.2	1.9
Other	1.36	0.0	1.7	2.0
<u>Cardiac Tests/Procedures</u>				
Cardiac Catheterization and/or Angiography	13.43	0.0	2.0	1.4
EKG	15.40	1.3	60.5	2.2
Rhythm EKG	0.41	0.0	1.7	2.7
24 Hour ECG Monitoring	1.59	0.0	2.1	1.1
Stress Tests	0.83	0.0	1.2	1.1
Echocardiogram	20.51	0.2	14.3	1.7
RMP	1.07	0.0	1.0	1.2
Cardiac Blood Pool	1.87	0.0	2.4	1.1
<u>Pulmonary Equipment and Tests</u>				
Oxygen and Related Respiratory Equipment, IPPB Machines, Humidifiers	8.10	NA	6.4	NA
Nebulizers	2.94	NA	6.0	NA
Oxygen Concentrators	21.45	NA	7.6	NA
Analysis of Arterial Blood Gas	1.17	0.1	2.5	4.0
Other Pulmonary Function Tests	11.14	0.4	13.0	3.1
<u>Other</u>				
Radiology	56.00	2.5	77.0	3.3
Transport/Ambulance	11.48	NA	6.9	NA
Laboratory	9.44	NA	11.1	NA
Anesthesiology	10.33	NA	3.7	NA
Assistant at Surgery	1.26	NA	0.6	NA
All Other Services	126.62	NA	24.5	NA
<u>Total</u>	<u>\$759.98</u>			

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-11

PART B EXPENDITURE AND SERVICE UTILIZATION POST-DISCHARGE;
CHRONIC OBSTRUCTIVE PULMONARY DISEASE

	Mean Expenditure Per Enrollee	Mean Number of Services	Percent Receiving Service	Mean Number of Services Per Recipient
<u>TYPE OF SERVICE</u>				
<u>Visits</u>				
Office	\$30.86	1.1	60.4 %	1.8
Emergency Room	12.43	0.2	15.5	1.4
Consultations	2.12	0.0	2.3	1.1
Other	3.59	0.1	6.3	1.6
<u>Cardiac Tests/Procedures</u>				
Cardiac Catheterization and/or Angiography	0.50	0.0	0.1	1.5
EKG	2.48	0.1	9.85	1.3
Rhythm EKG	0.21	0.0	1.6	1.3
24 Hour ECG Monitoring	1.09	0.0	0.6	1.5
Echocardiogram	1.59	0.0	0.7	1.6
<u>Pulmonary Equipment and Tests</u>				
Oxygen and Related Respiratory Equip, IPPB Machines, Humidifiers	19.42	NA	13.8	NA
Nebulizers	7.72	NA	15.4	NA
Oxygen Concentrators	46.69	NA	16.4	NA
Analysis of Arterial Blood Gas	0.48	0.0	1.2	1.2
Other Pulmonary Function Tests	4.36	0.1	7.6	2.0
<u>Other</u>				
Radiology	10.20	0.3	19.3	1.7
Transport/Ambulance	21.41	NA	8.0	NA
Laboratory	13.77	NA	28.6	NA
All Other Services	58.75	NA	43.3	NA
<u>Total</u>	\$237.66			

NOTE: 30 days after Index admission

SOURCE: CHER Analysis of 1991 NCH Physician/Supplier claims for a 5 percent sample of beneficiaries.

TABLE 3-12

PERCENT OF AMI PATIENTS RECEIVING CABG, PTCA, OR CARDIAC CATHETERIZATION
BY PATIENT CHARACTERISTICS(1)

	<u>CABG</u>	<u>PTCA</u>	<u>CATHETERIZATION</u>
<u>GENDER</u>			
Male	13.2 %	25.3 %	47.1 %
Female	9.7	12.7	40.7
<u>RACE</u>			
White	12.1	13.0	45.0
Black	6.0	7.9	32.2
<u>MEDICAID ELIGIBILITY</u>			
No	12.3	13.2	45.6
Yes	8.0	8.2	32.1
<u>LOCATION</u>			
Urban	12.1	12.7	45.2
Rural	10.9	12.3	41.6

(1)Age-adjusted.

SOURCE: CHER analysis of 1991 NCH physician/supplier claims from a 5 percent sample of beneficiaries.

REFERENCE

Mitchell, Janet B., "Time Trends in Inpatient Physician Spending", Health Services Research,
Forthcoming.

TECHNICAL APPENDIX
ON USING
NCH AND ANCHR

1.0 INTRODUCTION

The original intention had been to develop such episodes of care from a wide variety of medical and surgical conditions, using the 1990 linked BMAD beneficiary file. However, by the time this project was funded, National Claims History (NCH) data became available for the first time. HCFA requested that the episodes of care be constructed from 1991 NCH data. In addition, they requested that we do so, using the Access to the National Claims History Repository (ANCHR) software system, especially designed to access the NCH on-line. Because the ANCHR system was not fully developed and had not yet been de-bugged, this proved to be a lengthy task. Also, the NCH data base itself had not been completely documented and few cleaning algorithms had yet been developed and implemented by HCFA. For all of these reasons (described in detail in the next chapter), more than twelve months passed before any claims were available for analysis. At that time, it was decided that episodes of care would be created for three test conditions: one acute medical, one surgical, and one chronic medical.

2.0 Methods

2.1 Prior Approaches to Constructing Episodes of Care

At the Center for Health Economics Research, we have frequently constructed episodes of care, using merged Part A and Part B claims data. Under the pre-NCH data system, this was easily (and quickly) done using Medpar and BMAD beneficiary files. Because of the numerous difficulties encountered using NCH and ANCHR for the same purpose, it is worth briefly reviewing the process.

Suppose, for example, we wanted to construct episodes of care for CABG and AMI patients. To search for patients undergoing CABG surgery, we would find all claims in the BMAD beneficiary file with the CPT-4 codes in the range 33510 to 33528. Similarly, to search for patients admitted with AMI, we would find all claims in the Medpar file with a principal

ICD-9 diagnosis of 410. We would then write out the HIC numbers of all beneficiaries undergoing CABG surgery, and admitted with an AMI, respectively. We would then go back and read through both the Medpar and BMAD files, selecting off all claims with matching HIC numbers. Both the sample selection and full data extraction steps could be performed within the space of a few days. With all claims in hand, we would then proceed to construct an episode of care file for each condition.

2.2 Using ANCHR to Define the Sample

There are two steps in obtaining the claims necessary to construct an episode of care: (1) to identify the patients of interest, based on diagnosis or procedure codes (also known as constructing the finder file); and (2) to extract all claims for those patients. HCFA had asked us to use ANCHR for both steps. As it turned out, the first step was extremely tedious and very time-consuming using ANCHR and the second step could not be conducted at all with ANCHR.

The ANCHR system provides on-line access to the NCH data available on random access devices. It was designed to allow researchers to sit down at a terminal connected to the HCFA Data Center and enter search criteria, asking, for example, for all beneficiaries hospitalized for AMI in 1991. The system was then supposed to output a customized record for each of these admissions, including only the data fields requested by the researcher. The HIC numbers from these hospital claims could then be put in a finder file, allowing us to obtain all other claims data on all record types for these beneficiaries from the NCH system. The importance of the ANCHR on-line system was that it was supposed to allow nearly instant access to much of the NCH data as well as quick turn-around on jobs requesting other data. Unfortunately, four major problems developed.

First, physician/supplier records are divided into two distinct files, one for the header information and one for the line-item segments. Although there was a link between the two

files, the system would not accept a search argument that examined key variables on both header and line-item information at the same time. This meant, for example, that we could not submit a search to identify all beneficiaries undergoing CABG surgery in 1991, as the field for the procedure code (to identify CABG procedures) was located on the line-item file, while the date of service key field was located on the header file. There was no immediate work-around for this problem. We were forced to obtain claims for all CABGs performed during the four-year period maintained on ANCHR, convert the data into SAS, and then extract only the claims we wanted (with date of service 1991).

Second, ANCHR had a significant limitation on the number of characters that could be included in a search string or argument. Unlike most programming languages and utility programs, ANCHOR did not allow one to specify a range of procedure codes or diagnoses. For example, there are nine distinct CPT codes that specify CABG procedures. When Boolean operators (AND or OR) were included, the number of characters required to specify all nine CABG procedures was so long, we had spread it over a minimum of three different searches, resulting in at least three different output files. Similarly, primary diagnoses for hospital admissions could not be specified at the three-digit level (for example, 410 for acute myocardial infarction), but needed to include more than 30 possible permutations of AMI diagnoses codes at the three-, four- and five-digit levels. These limitations meant that for our original research project involving 8 to 12 different groups of medical conditions, we would have had to submit hundreds of searches to the ANCHR system just to obtain the first level of data, the hospital or physician claims that identified a beneficiary as having a particular medical or surgical condition.

Third, the ANCHR system had severe limitations on the volume of data that it could output from a single search, in terms of both the customized record length and the number of records retrieved. We found that search arguments that were routine for us (such as 1991 CABGs) would tie up the ANCHR system for many hours or simply crash the system. To make allowances for these volume limitations, we had to further fragment our searches, for

example, by searching for a single CABG procedure code at a time to minimize the search output. We eventually needed to produce nine different searches to obtain data for 1991 CABG procedures, one for each code, resulting in nine separate output data sets for what we considered a single group of procedures.

Fourth, another significant limitation of the ANCHR system was that the finder file logic had not yet been implemented. This meant that even after identifying beneficiaries meeting medical, surgical, and date of service criteria for our samples, we could not then use the ANCHR system to obtain all other claims data for these beneficiaries. We had to turn to the batch Menu Driven Access to the 100% Near Line file (MANRLINE) system to obtain further output.

This process took us from January 1992 to July 1992 to complete. It was particularly time-consuming because we identified most of these ANCHR limitations on our own; none of them were documented in the ANCHR user's manual.

2.3 Using MANRLINE to Extract Claims

The MANRLINE system is a batch or background processing system that obtains data from the single large National Claims History data base containing four years of all claims data for all beneficiaries. It is designed to take data requests from a number of different users and include a number of different search criteria in the same batch processing run. Because the data base is so large, batch jobs run against it at the HCFA Data Center environment frequently took four or more weeks to complete. Because the MANRLINE is so costly and time-consuming, HCFA generally scheduled such processing no more frequently than once a month.

Our first experience with the MANRLINE system came in July. Using the ANCHR system, we had developed a finder file (a list of HICNOs) for a limited number of medical and surgical conditions and had sent the file to HCFA to be included in the next batch MANRLINE

run. Because we had missed the early July deadline by a few days, our request was included in the next job which began in mid-September and finished in late October. Thus, we did not receive any output from our July request until early November, a delay of nearly four months. Only then could we begin examining NCH physician/supplier records at first hand.

2.4 Cleaning the NCH Data

Once we received the NCH data, we had to learn how to separate NCH output into distinct record types and then learn how to clean each file. Cleaning included both (1) eliminating duplicates and denials; and (2) making adjustments for canceled sequences of claims. It took several months and many phone calls to HCFA just to develop algorithms for physician/supplier records. One of the difficulties was the absence of any real documentation of the NCH, other than a data element dictionary. This forced us to develop our own "how to" strategies for using the NCH data.

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